

Trends in Cardiovascular Rehabilitation

Trend in Cardiologia Riabilitativa

Pantaleo Giannuzzi

Monaldi Arch Chest Dis 2006; 66: 44-47.

Salvatore Maugeri Foundation, Institute for Clinical Care and Research (IRCCS), Scientific Institute of Veruno, Via per Revislate 13, 28010 (NO) Veruno Italy.

Corresponding author: Pantaleo Giannuzzi MD; Salvatore Maugeri Foundation; Institute for Clinical Care and Research (IRCCS); Scientific Institute of Veruno; Via per Revislate 13 28010 Veruno (NO) Italy; E-mail address: pgiannuzzi@fsm.it

Background and rationale

Cardiac Rehabilitation (CR) programmes were first developed in the 1960s when the benefits of ambulation during prolonged hospitalization for coronary events had been documented. Exercise was the primary component of these programmes. They were predominantly offered to survivors of uncomplicated myocardial infarction and initiated at a time remote from the acute event. Concern about the safety of unsupervised exercise after discharge led to the development of highly structured rehabilitation programmes that were supervised by physicians and included electrocardiographic monitoring. The safety and benefits of moderate-intensity exercise training programmes were intensively investigated in supervised programmes. More recent data clearly indicates that unsupervised or home-based programmes are also safe and effective in appropriately selected patients [1-11]. Furthermore, favourable effects of exercise training have also been demonstrated in patients with large myocardial infarctions, left ventricular dysfunction and even in heart failure [12-22].

During the past three decades, changes in the delivery of rehabilitative care for cardiac patients have reflected changes in demography and characteristics of the patients, and predominantly reflect changes in clinical care. In the early years of CR, most patients enrolled in exercise training programmes were those who had recovered from uncomplicated myocardial infarction. In subsequent years, post-infarction patients with complications were also included and considered for more limited and gradual exercise rehabilitation. Many patients who currently receive rehabilitation services are recovering from CABG, PTCA or other forms of myocardial revascularization. With ageing of the population, cardiac rehabilitative care is now provided to a sizeable number of older-patients, many of whom have severe and complicated coronary illness and serious associated pathologies [3, 4, 5, 12]. Furthermore, many patients once considered to be too high risk for structured re-

habilitation programmes, such as patients with residual myocardial ischemia, compensated heart failure, serious arrhythmias, and implanted cardiac devices (pacemaker, ventricular resynchronization, ICD) currently derive benefit from more gradual and more protracted and often supervised exercise training [3, 4, 7, 9, 10, 12, 22]. This is combined with education, counselling, behavioural strategies and other psychosocial interventions and vocational counselling strategies to assist the patient to achieve coronary risk reduction and other cardiovascular health-related goals [4, 12].

CR is now considered a multifactorial process that includes clinical assistance and optimised therapy to relief symptoms and achieve clinical stability, exercise training, education and counselling regarding risk reduction and lifestyle changes, the use of behavioural interventions, vocational counselling, and adequate follow-up. These services are an essential component of the contemporary management of patients with multiple presentations of coronary heart disease and with heart failure and should be integrated into a long-term comprehensive care of all cardiac patients.

The progressive ageing of the population, the increasing accuracy of diagnostic procedures and the spreading use of potent cardiovascular drugs for the treatment of acute coronary syndromes and heart failure will lead to an estimated increase in the prevalence of ischemic heart disease of about 30%, even with a predicted decrease in incidence rate of 25%. The population is clearly becoming older and sicker, and the prevalence of serious comorbid conditions such as diabetes mellitus and cerebrovascular diseases among patients admitted for acute coronary syndromes is striking. The demographics of patients undergoing surgical coronary revascularization and valvular interventions are changing rapidly as well. This population is characteristically older, more commonly female, advanced in age, likely to have three-vessel disease or abnormal LV function, comorbidity, and more complications. In addition, because of the ageing of the population, the number

of patients with chronic heart failure and the health care impact of this syndrome is growing. All of these patients have a great need for cardiac care, clinical assistance, and psychosocial support after the acute phase.

Importantly, with continuing shortening of length of stay, the amount of time spent in the hospital during the acute event is no longer adequate to verify clinical stability, to perform a comprehensive risk stratification, to promote functional recovery, and to acquire the skills required to monitor exercise activity or to cover the educational material adequately. For these reasons, we see a greater need for structured residential CR programs, especially for high risk patients and those more incapacitated, to facilitate the transition to an independent life at home and the adherence to an individualised long-lasting outpatient program for clinical monitoring, lifestyle changes and effective secondary prevention.

Risk stratification for appropriate modality of CR

Authoritative, detailed documents addressing the organisational structure, delivery, and management approaches to CR services highlight the value of *risk stratification* of cardiac patients as a basis for *individual* therapeutic interventions, prescription of exercise training and appropriate exercise supervision, educational and behavioural interventions.

Medical evaluation of the patients, including complications during the acute event and present clinical status, and assessment of their level of risk are the first steps of CR. This stratification should include the evaluation of the risk of progression of coronary artery disease (namely known coronary risk factors and inappropriate lifestyle) and the risk of cardiovascular events. Risk stratification of cardiac events is based on the assessment of clinical stability, of ventricular dysfunction, functional capacity, myocardial ischaemia and arrhythmias. Patients are classified as at low, intermediate or high risk level. *Low risk patients* are characterised by: uncomplicated in-hospital course during the acute phase, preserved left ventricular function (i.e. ejection fraction $\geq 50\%$), no detectable residual ischaemia, no complex arrhythmias, functional capacity >6 METS on graded exercise. *Intermediate risk patients* are defined by: left ventricular ejection fraction between 31 and 49% or below 40% with preserved functional capacity, myocardial ischaemia at intermediate level or exercise ST-segment depression below 2 mm, or reversible defects during stress echocardiography or nuclear radiography, no sustained ventricular arrhythmias. *High risk patients* are: survivors of sudden cardiac arrest, with in-hospital complications during the acute phase (cardiogenic shock, heart failure, severe arrhythmias, respiratory insufficiency, recurrent ischaemia) or persistent clinical instability (decompensation, respiratory distress, renal insufficiency, infections, marked deconditioning), with severely depressed LV function (i.e. ejection fraction $\leq 30\%$) or below 40% with low functional capacity, with severe coronary artery disease, marked induced my-

ocardial ischaemia with ST-segment depression >2 mm, or extensive ischaemia occurring at low threshold (<6 METS or <100 watts), or severe reversible perfusion defect, with complex ventricular arrhythmias at rest or appearing or increasing with exercise, and with a decrease in systolic blood pressure of >15 mmHg during effort or failure to rise during graded exercise testing, with high level of disability. The initial assessment should incorporate the patient's educational, psychosocial status, lifestyle and social needs as a basis for recommending interventions.

CR Services and patterns of rehabilitative care

The WHO classifies CR facilities into three categories depending on the qualifications of staff members, on the equipment and on the complexity and specialisation of interventions: a) basic facilities, delivering care and interventions at the community level (using schools, gymnasiums, clubs), b) intermediate facilities developed within a city hospital; c) advanced facilities in a major CR centre, where high levels of medical services are available.

Basic facilities should be reserved for low-risk patients, mainly directed towards stable, chronic patients, in order to maintain them at the highest level of independence, to promote appropriate lifestyle changes for effective secondary prevention, and to reduce the risk of subsequent cardiac events. Intermediate or advanced CR facilities should be reserved for patients in the early phase of their disease and for those with high or intermediate risk stratification. Different patterns of rehabilitative care are currently delivered by specialised hospital-based teams: residential CR for more complicated, disabled patients; and outpatient CR for more independent, low risk and clinically stable patients requiring less supervision. There may be variations of individual or group programmes and centre-based or home-based programmes.

While the objectives are identical to those of the outpatient CR programmes, residential rehabilitation programmes are specifically structured to provide more intensive and/or complex interventions, and have the advantage being able to start early after the acute event, to include more complicated high risk or clinically unstable patients, to include more severe incapacitated and/or elderly patients (especially those with co-morbidity), and thus, to facilitate the transition from the hospital phase to a more stable clinical condition which may allow the maintenance of an independent life at home. One major disadvantage of residential programmes is the relatively short duration of intervention with regard to risk factor management and lifestyle changes. Therefore, residential CR programmes should be followed-up by a long-term outpatient risk reduction and secondary prevention programme, with appropriate clinical and functional monitoring. Home-based rehabilitation programmes directed by physicians and coordinated by nurses have also been developed as a way of expanding the delivery of secondary prevention services.

The Working group on Cardiac Rehabilitation and Exercise Physiology of the European Society of Cardiology [3] strongly emphasises that CR programmes should consist of a multifaceted and multidisciplinary approach to overall cardiovascular risk reduction, and that programmes that consist of exercise training alone are not considered CR. It should be also recognised that exercise is often the vehicle for facilitating other aspects of CR, including coronary risk reduction and optimisation of psychosocial support. Thus, evaluation of the overall quality of life impact should become an integral part of outcome measures of rehabilitation.

Core components of Cardiac Rehabilitation/secondary prevention programmes are: baseline patient assessment; physical activity counselling and exercise training; nutritional counselling; risk factor management (lipids, hypertension, weight, diabetes, and smoking); psychosocial management, vocational counselling and optimised medical therapy. The way CR is delivered varies depending on national circumstances and resources. The provision of these services by specialised hospital-based teams in an out-patient setting is recommended, and a period of 8-12 weeks is considered adequate to cover the core components of cardiac rehabilitation/secondary prevention programmes appropriately. Shorter programmes may be considered under special circumstances but their efficiency is not proven in the literature. All patients after an acute cardiovascular event should be entered into a comprehensive, multidisciplinary intensive CR programme. On completion of this 'introductory' programme of secondary prevention, they should be oriented to a long-term maintenance regimen with the use of support systems such as coronary clubs, gymnasias or other facilities to promote long-term prevention strategies in the community.

Indication for residential CR

Generally, Residential CR, either in a city hospital or in a major CR centre, is preferable for intermediate-high risk patients, especially for those with complicated in-hospital course during the acute phase or persistent clinical instability, to promote more stable clinical conditions and a more rapid functional recovery.

Residential CR programs are reserved for the following categories of patients:

- a) patients with severe in-hospital complications after myocardial infarction, cardiac surgery or PTCA;
 - b) patients with persistent clinical instability or complications after the acute event, or serious concomitant diseases at high risk of cardiovascular events;
 - c) clinically unstable patients with advanced heart failure (Class III and IV), particularly those who are candidates for heart transplantation, and/or those needing intermittent or continuous drug infusion and/or mechanical support;
 - d) patients after a recent heart transplantation.
- In addition,
- e) patients discharged very early after the acute event, even uncomplicated, particularly if they are older, females, or at higher risk of progression of coronary artery disease, and

- f) patients unable to attend a formal outpatient CR program for any logistic reasons should also be considered for residential CR programs.

Programmes and staffing for Residential CR

Residential CR at an intermediate level should assure basic clinical care and ability to cope with any possible emergencies; non-invasive prognostic and functional evaluation for comprehensive risk stratification; controlled exercise training with appropriate supervision; health education programs and counselling regarding risk reduction and lifestyle changes; psychosocial status assessment and the use of behavioural interventions. Therefore, in addition to cardiologists, the staff must include nurses, rehabilitation therapists, a dietician and a psychologist in consultation with occupational health specialist.

Advanced Residential CR is provided in highly specialised major CR centres, where high level of medical services, qualification of staff members, multidisciplinary care, assistance and interventions are available. They should offer sophisticated non-invasive diagnostic techniques (including nuclear cardiology); invasive procedures and monitoring (right-heart haemodynamics); ergometric and occupational evaluation with appropriate interventions, a deep screening for known and less well-known coronary risk factors, including genetic determinations particularly for patients with premature coronary artery disease; specific educational and behavioural interventions and psychosocial support for selected patients. *An intermediate care unit or heart failure unit* is also required for treatment and monitoring of more complicated, clinically unstable patients, especially those with advanced heart failure, and those potential candidates or in awaiting list for heart transplantation. In these patients a multidisciplinary clinical and psychosocial support, appropriate health educational and vocational interventions, together with adequate follow-up in collaboration with the family physician should be provided.

After the residential interventions, CR should be continued and integrated into a long-lasting outpatient program either at an intermediate or advanced CR service, depending on the patient's needs.

Conclusion

While the objectives are identical to those of the outpatient Cardiac Rehabilitation (CR) programs, Residential Rehabilitation programs are specifically structured to provide more intensive and/or complex interventions, and have the advantage being able 1) to start earlier after the acute event, 2) to include high risk more complicated, or clinically unstable patients, 3) to include more severe incapacitated and/or elderly patients (especially those with comorbidity), and thus, 4) to facilitate the transition from the hospital phase to a more stable clinical condition and the maintenance of an independent life at home. Ideally, Residential CR programs should be followed up by a long lasting outpatient risk reduction and secondary prevention program, with appropriate clinical and functional monitoring.

References

1. Recommendations by the Working Group on Cardiac Rehabilitation of the European Society of Cardiology. Longterm comprehensive care of cardiac patients. *Eur Heart J* 1992; 13 (Suppl C): 1C-45C.
2. Rehabilitation after cardiovascular diseases, with special emphasis on developing countries: report of a WHO Committee. *World Health Organ Tech Rep Ser* 1993; 831: 1-122. 3 P. Giannuzzi, *et al.* Position Paper of the Working group on Cardiac Rehabilitation and Exercise Physiology of the European Society of Cardiology. *Eur Heart J* 2003; 24: 1273-1278.
4. Ades PA. Cardiac rehabilitation and secondary prevention of coronary heart disease. *N Engl J Med* 2001; 345: 892-902.
5. Pasquali SK, Alexander KP, Peterson ED. Cardiac rehabilitation in the elderly. *Am Heart J* 2001; 142 (5): 748-55.
6. EUROASPIRE II Study Group. EUROASPIRE II. Lifestyle and risk factor management and use of drug therapies in coronary patients from 15 countries. *Eur Heart J* 2001; 22: 554-72.
7. Wenger NK, Froelicher ES, Smith LK, *et al.* Cardiac rehabilitation. Clinical practice guideline. No.17 Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research and the National Heart, Lung, and Blood Institute. AHCPR No. 96-0672. October 1995.
8. Fletcher GF, Balady G, Blair SN, *et al.* Statement on exercise: benefits and recommendations for physical activity programs for all Americans. A statement for health professionals by the committee on exercise and cardiac rehabilitation of the council on clinical cardiology, American Heart Association. *Circulation* 1996; 94: 857-62.
9. Cobelli F, Tavazzi L. Relative role of ambulatory and residential rehabilitation. *Journal of Cardiovascular Risk* 1996; 3: 172-5.
10. Effective Health Care: Cardiac Rehabilitation. *Effective Health Care Bulletins* 1998; Vol. 4, no. 4 ISSN: 0965-0288: 1-12. Latimer Trend & Company Ltd., Plymouth.
11. Monpere C. Cardiac Rehabilitation: Guidelines and Recommendations. *Dis Manage Health Outcomes* 1998; 4: 143-56.
12. Balady GJ, Ades PA, Comoss P, *et al.* Core components of cardiac rehabilitation/secondary prevention programs. A statement for healthcare professionals from the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation. *Circulation* 2000; 102: 1069-73.
13. Smith SC, Blair SN, Bonow RO, *et al.* AHA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease: 2001 update. *Circulation* 2001; 104: 1577-9.
14. Fletcher GF, Balady GJ, Ezra A, *et al.* AHA scientific statement: exercise standards for testing and training. *Circulation* 2001; 104: 1694-740.
15. Jolliffe JA, Rees K, Taylor RS, *et al.* Exercise-based rehabilitation for coronary heart disease. The Cochrane Library, Volume (Issue 3) 2001.
16. Dugmore LD, Tipson RJ, Phillips MH, *et al.* Changes in cardiorespiratory fitness, psychological wellbeing, quality of life, and vocational status following a 12 month cardiac exercise rehabilitation programme. *Heart* 1999; 81: 359-66.
17. Oldridge NB, Guyatt GH, Fischer ME, *et al.* Cardiac rehabilitation after myocardial infarction. Combined experience of randomized clinical trials. *JAMA* 1988; 260: 945-50.
18. O'Connor GT, Buring JE, Yusuf S, *et al.* An overview of randomized trials of rehabilitation with exercise after myocardial infarction. *Circulation* 1989; 80: 234-44.
19. Vanhees L, Mc Gee HM, Dugmore LD, Schepers D, Van Daele P; Carinex Working Group: Cardiac Rehabilitation Information Exchange. A representative study of cardiac rehabilitation activities in European Union Member States: the Carinex survey. *J Cardiopulm Rehabil* 2002 Jul-Aug; 22 (4): 264-72.
20. Hambrecht R, Gielen S, Linke A, *et al.* Effects of exercise training on left ventricular function and peripheral resistance in patients with chronic heart failure: A randomized trial. *JAMA* 2000; 283: 3095-101.
21. Belardinelli R, Georgiou D, Cianci G, *et al.* Randomized controlled trial of long-term moderate exercise training in chronic heart failure: effects on functional capacity, quality of life, and clinical outcome. *Circulation* 1999; 99: 1173-82.
22. Giannuzzi P, Tavazzi L, Meyer K, *et al.* for the Working Group on Cardiac Rehabilitation & Exercise physiology and Working Group on Heart Failure of the European Society of Cardiology. Recommendations for exercise training in chronic heart failure patients. *Eur Heart J* 2001; 22: 125-135.